CLAIMS

1. A line converter including a three-dimensional waveguide for propagating an electromagnetic wave in a three-dimensional space and a plane circuit having a predetermined conductor pattern formed on a dielectric substrate, the line converter being characterized in that the dielectric substrate is provided, so as to be parallel to a plane E of the three-dimensional waveguide and at a nearly center part of the three-dimensional waveguide and the conductor pattern of the dielectric substrate includes a conductor part forming a shield area of the three-dimensional waveguide, a coupling-line part that is electromagnetically coupled to a standing wave that occurs in the shield area, and a transmission-line part continuing from the coupling-line part.

2. The line converter according to Claim 1, the line converter being characterized in that the conductor part is formed, as ground conductors formed on both faces of the dielectric substrate.

3. The line converter according to Claim 2, the line converter being characterized by having a plurality of conduction paths that penetrates the dielectric substrate and that is aligned on at least one of both sides of the transmission line, so as to be away from the transmission line by as much as a predetermined distance, so that

conduction is established between the ground conductors formed on the both faces of the dielectric substrate.

4. The line converter according to Claim 1, Claim 2, or Claim 3, the line converter being characterized in that a conductor of the three-dimensional waveguide is divided into two parts including an upper part and a lower part by a plane parallel to the plane E and a space is provided in the conductor of the three-dimensional waveguide, so as to create a choke by the space, where the space is provided at a position away from the three-dimensional waveguide by as much as a predetermined distance, so as to be parallel to an electromagnetic-wave propagation direction of the three-dimensional waveguide.

5. The line converter according to Claim 1, Claim 2, or Claim 3, the line converter being characterized in that the transmission-line part is formed, as a micro-strip line including the ground conductor formed on one of the faces of the dielectric substrate and a line conductor formed on the face opposing thereto and the coupling-line part is formed, as a suspended line including the line conductor formed on one of the faces of the dielectric substrate and the conductor of the three-dimensional waveguide.

6. A high-frequency module including the line converter according to Claim 1, Claim 2, or Claim 3 and a high-frequency circuit connected to each of the plane circuit and

the three-dimensional waveguide of the line converter.

7. A high-frequency module including the line converter according to Claim 4 and a high-frequency circuit connected to each of the plane circuit and the three-dimensional waveguide of the line converter.

8. A high-frequency module including the line converter according to Claim 5 and a high-frequency circuit connected to each of the plane circuit and the three-dimensional waveguide of the line converter.

9. A communication device including the high-frequency module according to Claim 6 in a unit for transmitting and receiving an electromagnetic wave.

10. A communication device including the high-frequency module according to Claim 7 in a unit for transmitting and receiving an electromagnetic wave.

11. A communication device including the high-frequency module according to Claim 8 in a unit for transmitting and receiving an electromagnetic wave.